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respectively "The Place of the Social Sciences in a Classification of Knowledges," "The General Historical Laws, the Anthropological Bases of a Science of Socialization," and "The Application of General Historical Laws to Contemporary Events." The ethical approach finds its representatives in Professor Hoeffding, who writes on the Relation between Sociology and Ethics, and in Dr. Westermarck, who contributes an essay on the Influence of Magic on Social Relationships. An attempt to apply psychology to sociology is made in Professor Sadler's article, "The School in some of its Relations to Social Organization and to National Life." The biological course is pursued in three very important papers by Mr. Galton, all dealing with his own science of eugenics: "Restrictions in Marriage," "Studies in National Eugenics," and "Eugenics as a Factor in Religion." Finally, the geographical approach is represented by the second part of Professor Geddes' memoir on "Civics as Applied Sociology," the first installment of which appeared in the preceding volume. Not the least interesting part of the contents of the present collection is the Discussion—formal and informal, written and spoken—appended to the original papers.

M. W. WISEMAN.

The Color Sensitivity of the Peripheral Retina, by JOHN WALLACE BAIRD. Published by the Carnegie Institution, Washington, May, 1905. pp. 80.

The first thirty-four pages of this paper are devoted to an exhaustive review of the work already done on peripheral vision. This review is exceedingly valuable, as it makes clear the present status of the problem.

Dr. Baird finds much greater uniformity of opinion with regard to the change observed in the tone of each color as its image is moved from the fovea to the periphery of the retina, than concerning the relative extension of the color fields, since the very decided differences in the methods employed by various investigators would naturally prove much more productive of disagreement in a strictly quantitative measurement than in the mere observations of a qualitative change.

Many investigators have failed to equate in brightness and intensity, the colors they have used. One field, for example, that of red, has been determined with an intense stimulus, and another field, in the same experiment, perhaps that for green, with a stimulus of less intensity. Under these circumstances, there seems to be no reason why any co-extension of fields should be discovered even though it really existed, since it is a well known fact that intensity of stimulus directly affects the visibility of a given color.

The following is a summary of the results so far agreed upon.

"It has been established that color sensitivity decreases gradually from the centre to the periphery of the retina; that every color stimulus is correctly recognized within a certain retinal zone, whose extent varies directly with the tone, the brightness (absolute and relative), the saturation, and the area of the stimulus, and with changing conditions of adaptation and of refraction; that under certain conditions¹ the zone of a certain red² is co-extensive with that of a green, while that of yellow is also co-extensive with that of blue; that the yellow-blue zone has a much wider extension than the red-green zone; that all colors, excepting the four mentioned above, pass through certain regular transitions of tone as they appear upon more and more pe-

¹ By "certain conditions"—the author means that external conditions remain constant, and the colors are equated in brightness and saturations.

² "A certain red"—i. e., a stable red or one that undergoes no change in tone as its image is moved from the fovea to the periphery. All four colors referred to are stable colors.

ripheral regions of the retina; that these transitions tend in the direction of yellow (when red, orange or green stimuli are employed) and blue (when violet stimuli are employed); and that with moderate stimulation all colors appear gray at the phiphery, while with a sufficiently intensive stimulation they may appear in their own tones."

The experimental work reported in this paper was carried out in the Psychological Laboratory of Cornell University, four Cornell students as well as Dr. Baird serving as subjects.

The apparatus was a duplicate of the Hellpach perimeter, which consisted of a steel quadrant of 1.1 meter radius, supported at a convenient height. The stimulus lantern, which could be clamped at any point desired on the quadrant, was enclosed in a black box having a circular opening 15 m. m. in diameter in the side toward the observer. This opening was covered by colored gelatin sheets combined so as to give the desired colors. The color was in each case subjected to spectral analysis. The fixation point consisted of a spot of light 5 m. m. in diameter.

The tests were all made in the dark room, the eyes being thoroughly dark-adapted. The stimuli were stationary, of three seconds duration and separated by an interval of six minutes.

Part I of the experiment is concerned with the determination "of the changes of tone which a color-stimulus undergoes during the movement of its image across the retina."

Seven spectral colors were employed as stimuli, *i. e.*, deep red, reddish orange, orange yellow, green, blue, violet and purple. As no comparison of the color fields was intended the colors were not equated in brightness and intensity. Three intensities of stimuli were used. The colors employed by Hellpach could not be exactly reproduced, as, owing to inaccuracy in his statements, it seemed impossible "to discover what were the wave-lengths of the stimuli employed in his experiments."

The results of part I are as follows: (1) "With a slight intensity of stimulus all colors appear colorless at the extreme periphery of the retina," (2) "When they are brought in far enough to appear colored, those of the red end of the spectrum first appear yellowish or yellow, while those of the blue end first appear bluish or blue; and that in assuming their proper tones they pass through a regular series of transitions." Stable red and green would be the only exceptions to the above statement. (3) During any single stimulation the color, in fading out, goes through a series of transitions in brightness and color-tone, analogous to those experienced when the image of the color is made to move from a less peripheral to a more peripheral region of the retina.

4. As the stimulus is made more intense the field for a given color is increased in extent.

5. *After-images* in the ordinary sense, were reported in but a few cases, and then only when the paracentral regions of the retina were stimulated. Though Dr. Baird failed to find after-images when peripheral regions of the retina were stimulated, he insists on the presence, in that region of certain *after-effects*; wholly latent in character but nevertheless, at times, influential in determining the color-effect of succeeding color-stimuli. He explains Hellpach's 'Gegenfarbige' zone (*i. e.*, an extreme peripheral zone in which the colors appeared in their complimentary instead of their true color tone) as due to these after-effects.¹ Our author found that results similar to those of Hellpach could be produced at any point on the retina by making the interval between stimulations short enough but that the compliment-

ary tone would disappear altogether provided the intervals were long enough. For example, yellow stimuli, given in succession with short intervals between stimulations, could be made to appear as blue, but if a long interval were interposed it would again appear as yellow. The following example will serve as an illustration.

Stimulus—*Yellow*; interval, *one minute*.

appeared at 65° as Yellowish.

“ at 55° as Yellow.

“ at 45° as Blue.

“ at 35° as Blue.

After a *Rest of five minutes in darkness*

appeared at 35° as Yellow.

“ at 45° as “

Dr. Baird gives no results of experimentation in which an interval equal to that allowed by Hellpach (*i. e.* three minutes) was introduced. The statement is made, however, that many tests were carried out with varying intervals, before the six minute interval was finally decided upon.

It seems surprising that such decided after-effects did not appear in the form of after-images and the question still remains whether they would not have done so had the stimulus been more intense and of longer duration.

It is also to be noted that these conclusions concerning the absence of after-images on the peripheral retina have not been established in the case of the light-adapted eye.

The second problem investigated by Dr. Baird is that of the relative extent of the color fields. In this part of the work the four stable colors were used exclusively as stimuli, *i. e.*, the yellow, the blue, the green and the red which undergo no change in peripheral vision.² It might be stated here that only four colors were found which do not change in tone as they are moved from the fovea to the periphery of the retina.

“The results show that the zone of a stable red is co-extensive with that of a stable green; that the zone of a stable yellow is co-extensive with that of a stable blue; that the yellow-blue zone is much more widely extended in all directions than is the red-green zone; that the nasal side of the retina has the widest extension of color sensitivity, and that there is a wide individual variation in zonal extension.”

These results are exceedingly interesting as this is the first dark-room experiment in which the four color fields have been determined with colors of equal white and color-values. The result is the discovery that the coincidence of the blue and yellow fields, and of the red and green fields, already established for the light-adapted eye; also holds for the dark-adapted eye.

The results agree with the Hering and the Ladd-Franklin theories of color vision but cannot be reconciled with any other theory.

Bryn Mawr College.

GRACE M. FERNALD,

Les Mystiques—Etude psychologique et sociale, par PAUL HERMANT.
Rev. de Synthes. Historique, 1905, Vol. 10, pp. 269-292; Vol. 11, pp. 32-53, 165-180.

This long study abounds in interesting quotations but is too indeterminate to have any definite historical, philosophical or psychological significance. The more valuable feature of Hermant's work is to be found in the parallels which he draws between Sufi, Buddhist, Moslem

¹ Hellpach's intervals between tests were of three minutes duration.

² Dr. Baird has called my attention to a slip on p. 60, namely, the statement that “the red stimulus transmitted no part of the visible spectrum.” What is meant is evidently that the red stimulus is non-spectral.

and Christian Mysticism, with the result that the essential characteristics of Christian Mysticism are seen to be common to all the religions considered.

JAMES H. LEUBA.

Practical Dietetics, with Reference to Diet in Disease, by ALIDA FRANCES PATTEE. A. F. Pattee, Publisher, New York. pp. 300. Price, \$1.

Any home-maker will find this book valuable. It gives explicit directions and plain reasons. An inexperienced person, able to follow such directions, may prepare successfully and serve properly food for the sick or for those needing to be careful in diet. In a few pages and without wearisome detail food values are set forth. Rules follow for feeding the sick and for serving their food daintily. Over half the book consists in exact recipes for food and drink, with precise directions from the first step to the placing before the patient. One is not left to "season to taste." Diet in Disease takes sixty pages, Diet in Infancy, fifteen; "Practical Suggestions to the Nurse in the Sick-room" is especially useful to the novice; tables of measures, and two complete indexes make the last of the three hundred pages. The head of the household will find this volume an excellent supplement to her professional library.

FLORENCE B. SANFORD.

BOOK NOTES.

Die Stofflichen Grundlagen der Vererbung im organischen Reich, von EDUARD STRASBURGER. Gustav Fischer, Jena, 1905. pp. 68.

In very many species the ova from which male and female arise is easily distinguishable by size, and this has favored the idea that sex is already determined in the egg. On the other hand, unfertilized eggs of bees produce males, that is, the so-called drones, while fertilized eggs produce females. Here, then, it would seem that fertilization determines the female sex. Some, however, hold, despite this, that bee eggs are male and female and that is only the female eggs are adapted to fertilization. Again the Hoffacker-Sadler law that male offspring predominate if the father is older than the mother and more girls are born if the mother is the older, and that the prospect for boys is but slightly greater than for girls if the father and mother are of the same age. So many objections have been raised against this law that it is at present uncertain. Still we cannot say that the exclusive influence of the female in determining sex is, at present, entirely disproven for the human race. For horses, Wilkens states, on the ground of copious statistics, that only the age of the mare affects sex, and that mares, when they are becoming older, tend to produce more stallions, no matter what the age of the male horse may be. Thus Strasburger thinks that, as in so many other cases, there may have been a division of labor between the male and female determination of sex, and that by giving it over to the egg a constant numerical relation of the sexes is best assured.

What advantage does an organism derive from the exchange of pangenes which apparently takes place in the gonotokonts within the fused ids and the effect of which is further increased by the division of the chromosomes? Weismann concluded that the products of the two sexes differed from each other in their content of the material of heredity. By the amphimixis of these products the visible individual differences of posterity arise. They, too, make possible the perma-